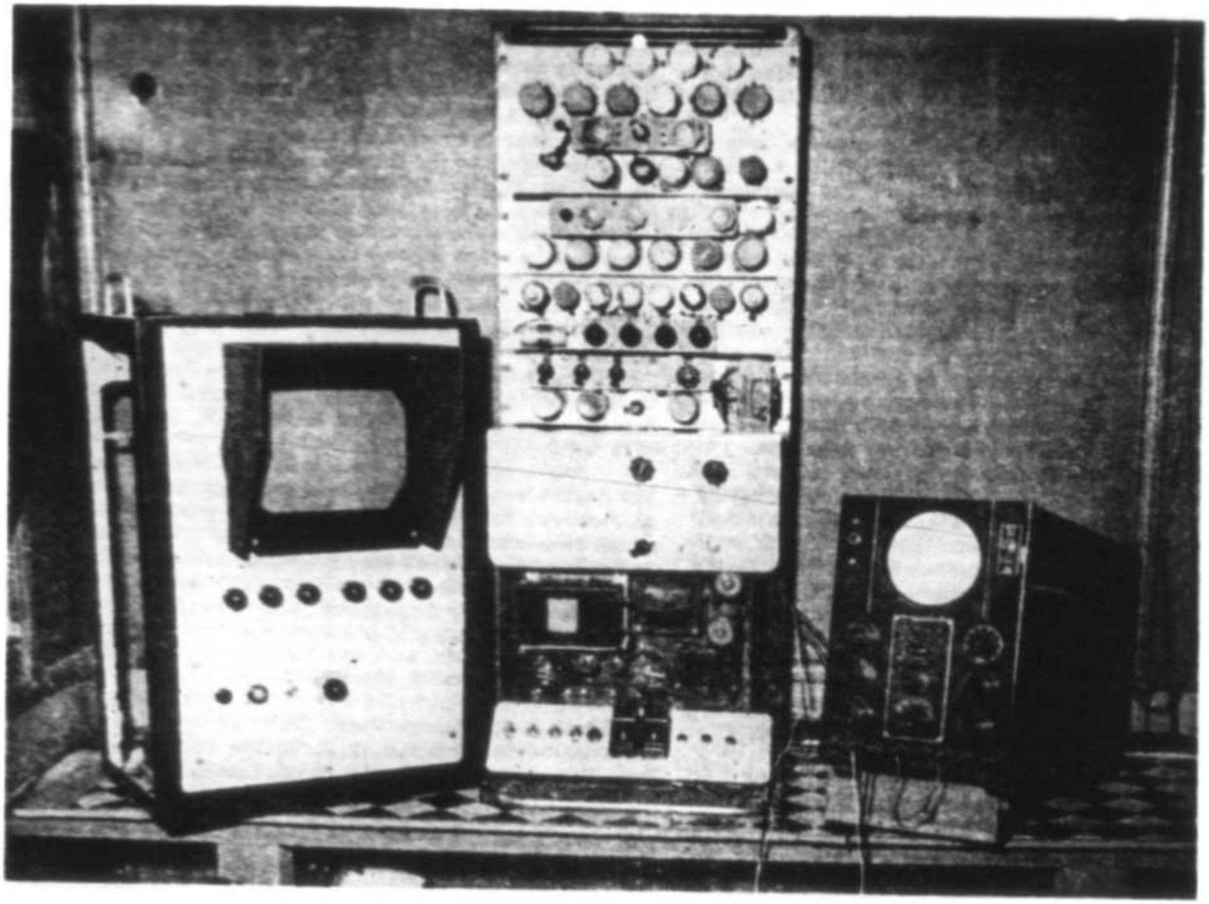


cq-tv

AUTUMN 1955

NUMBER 26

THE BRITISH AMATEUR TELEVISION CLUB

The British Amateur Television Club was founded in 1949 to co-ordinate the activities of amateur radio enthusiasts experimenting with television transmission, and to exchange information with other enthusiasts at home and abroad similarly engaged. The Club is affiliat to the Radio Society of Great Britain.

Experiments carried out by BATC members have been both over a closed circuit (i.e via a cable) and also over the air. Due to the complexity of the equipment required, very few members have the resources to build both sorts of equipment, and the majority are broadly divided into those who transmit good pictures over a cable, and those who transmit some sort of picture over a radio link, being more interested in the link side. From time to time public demonstrations are given by various demonstration teams of the Club. In order that this can be done, and also to permit any member's units to feed into any other member's units, certain Club standards have been recommended. A list of these is given inside the back cover of this magazine.

To transmit pictures over the air, members must hold GPO Television Transmitting Licences costing £2 per annum. The qualifications required are the same as for the normal amateur sound licence, but no morse test is required. Full details can be obtained from the Radio and Accommodation Department, GPO, St. Martin le Grand, London EC1. The licence also covers the use of a sound channel provided this is also in one of the television bands, and is not used except as an accompaniment to the vision signals. The vision bands are 425-455 Mc/s (70 cms), 1220-1295 Mc/s (25 cms), 2305-2445 Mc/s (13 cms), 5655-5845 Mc/s (6 cms), and 10,005-10495 Mc/s (3 cms); a maximum input to the final stage of 150 watts at peak white is permitted. Holders of ordinary amateur licences wishing to transmit pictures also require the /T licence, which is automatically issued on payment of the extra £2 charge.

Camera tubes are not normally available in this country, but the Club has arranged for the supply of a Vidicon type tube, rejected by the manufacturer for minor blemishes, at £25. Monoscopes are similarly available at £7-10-0, but both types are only available in the United Kingdom. Application forms can be had from the Assistant Secretary. Other camera tubes are occasionally advertised in the columns of "CQ-TV". Because of camera tube expense, flying spot scanning (FSS) both telecine and telestill, have received much attention from members. Using a 5FP7 scanner tube, and a 931A photocell, it is possible to televise transparencies with a resolution of 2.5 Mc/s for as little as £10.

Although not attempting to compete with professional laboratories, there are various enthusiastic research groups amongst the Club members. The colour tv group has obtained some very good pictures over a closed circuit, for instance. Some Club landmarks have been: May 1952 - the first ever two-way amateur TV contact (G3BLV/T-G5ZT/T); August 1953 - G2WJ/T received by G3GDR over a record distance of 34 miles; December 1953 - first amateur colour TV transmission.

As there is very little literature available that covers amateur requirements, the Club issues a quarterly magazine "CQ-TV" free to members. This contains circuits and notes, besides a list of current references. A few back copies are available from the Honorary Secretary at 1/6d each post free. In time the Club hopes to be able to produce a little booklet on Amateur TV, and to this end some pages of CQ-TV will be seen to have two numberings, one for the relevant issue, and one for this booklet. The Hon. Treasurer carries a stock of sundries - headed notepaper, club badges, membership certificates, QSL cards, and so on. Loans of films, posters, photos, lecture notes, recorded tapes, and equipment, can be arranged for demonstration purposes.

Club meetings are held on a local basis, and up to the minute information will be found in "CQ-TV". Meetings are sometimes held on the air, and details will be found in "CQ-TV".

Membership costs five shillings per annum, or the equivalent in local currency, payable on the first of January. New members are asked to enclose 6d per month remaining of the old year, plus 5/- for the following year. First subscriptions are receipted directly, but thereafter receipts are normally sent out with "CQ-TV". A membership application form will be found inside the rear cover.

The officers of the Club are:

President: Sir Ernest Fisk.
Chairman: C.Grant Dixon, M.A. 23 Wye St, Ross-on-Wye.
Hon. Secretary: D.W.Wheele, Grad.I.E.E, G3AKJ 56 Burlington Gardens, Chadwell Heath, Essex.
Hon. Treasurer: L.A.F.Stockley F.B.O.A, F.S.M.C, G3EKE 154 Charminster Rd, Bournemouth, Hants.
Hon. Editor: M.W.S.Barlow, B.A, Grad.I.E.E, G3CVO, 10 Baddow Place Ave, Gt. Baddow, Essex.
Assistant Secretary and Editor: D.S.Reid, B.A, 4 Bishops Rd, Chelmsford, Essex.
Committee: F.Rose Grad.I.E.E G3BLV, 16 North Bridge St, Sunderland.
Ian Waters BRS 17902 14 St Mary's St, Ely.
W.E.Hall esq, 11 Gransden Rd, London E8.

Technical enquiries are answered by the Technical Group (S.A.Es please) as follows:

Vidicon/Staticon cameras: D.Hooper G3ICU 42 Casselden Rd, London NW10.
Iconoscope cameras: D.Wheele (address above).
CPS cameras: C.G.Dixon(.. ..).
Colour TV: C.G.Dixon(.. ..).
Monoscopes: N.Harris 95 Fawe Park Rd, SW15.
Telecine: J.Woodfield G3HEK 77 Manchester Rd, Wilmslow, Ches.
Pulse Circuits: D.S.Reid (address above).

CQ-TV 26

Autumn 1955

At least five shillings per annum

Number Twenty-Six

Seventh Year

Published for the British Amateur
Television Club at 10, Baddow Place
Avenue, Gt. Baddow, Essex.

Editorial

All those who were able to attend agreed that the Convention was a great success. 70 members and visitors came along to the Bedford Corner Hotel to see Grant Dixon's colour camera and colour bar generator, Ivan Howard's staticon camera, monoscope and pattern generator, Doug Wheele's camera, Hubert Cox's Flying Spot Scanner, Brian Partridge's pulser and waveform generator, and the Chelmsford group's rack of gear, together with many other items. We hope to publish a more detailed account in the next edition, but there is one point that was raised at the Business Meeting, held after the lunch, which must be mentioned at once. This is the Financial Statement, and What Happened After.

In the unavoidable absence of the Treasurer, G3CVO read an interim Financial Statement from the Hon Treasurer, in which the latter explained that the Club was only just paying its way, and that this meant that the Club services were very much restricted. In fact, at present rates, CQs-TV 26 and 27 would have had to have been combined into one to save money. G3EKE therefore proposed that the subscription be raised to 7/6d per annum.

G3CVO followed by giving some details of production costs of CQ-TV, which is the main Club expense, of course. Allowing for an expected 15% rise in printing costs next year, we should have been limited to four eight-page-plus-cover editions in 1956, which would have been very unsatisfactory. The proposal to raise the subscription to 7/6 would mean that at least two editions could be twelve pages plus cover. At this point, Mr.F.H.Townsend, M.I.E.E, of Cathodeon Ltd, and one of the guests, asked if he might address the company. He then delivered a very forceful speech, explaining that he paid 5/- per annum to join his local village dramatic group, and he certainly did not get a quarterly journal for this fee. In like manner he went on to say that he thought (as a non-member) that 10/- at least was the amount that anyone should consider a reasonable subscription. Mr. Townsend's words were very well received, and Mr. W.Hall proposed an amendment that the subscription should be raised to 10/-. This was carried unanimously, and with acclamation - a very gratifying result for those of the BATC "staff".

The new subscription rates will come into force on January 1st 1956; subscriptions valid until a later date will be renewable at the new rate on the expiry of the present subscription. The raised rate will not mean a larger CQ-TV at first; indeed the full effect of the increased rate will not be felt for some time, as many members have paid for two or more years in advance at the old rate. The membership may drop somewhat as a result, but the increased Club funds will be used mainly as a reserve to finance such things as films, tapes, and booklets - such as "An Introduction to Amateur Television Transmission" due out in the Spring.

Just before the Convention, the Committee decided that Mr. Townsend should be asked to become Vice-President of the Club, in recognition of his services and help freely given to us. A unanimous vote confirmed the invitation, which Mr. Townsend kindly accepted.

The Convention itself obviously has inspired many members to greater efforts, but this is the season for Club meetings. All the Committee members are giving at least one lecture this Winter, and group secretaries are reminded to make use of the Club lecture tapes and films if stuck for lecturers. A short (10 minute) sound newsreel was made at the Convention, and this will be circulated to overseas members in due course. The second track has been left blank so that other groups may add messages to the tape. When sending tape to the BATC, please record at $3\frac{3}{4}$ i.p.s twin track. We hope to hear of other group meetings, such as the forthcoming meeting at Birmingham, to start activity going.

As we go to press, we are experimenting with covers for CQ-TV, so be prepared for anything. In particular, pressure of work makes it likely that No. 27 (Winter 1955) edition may not be out before Christmas.

73 G3CVO/T

STOP PRESS: BATC WILL BE AT RSGB SHOW NOV 23-26.

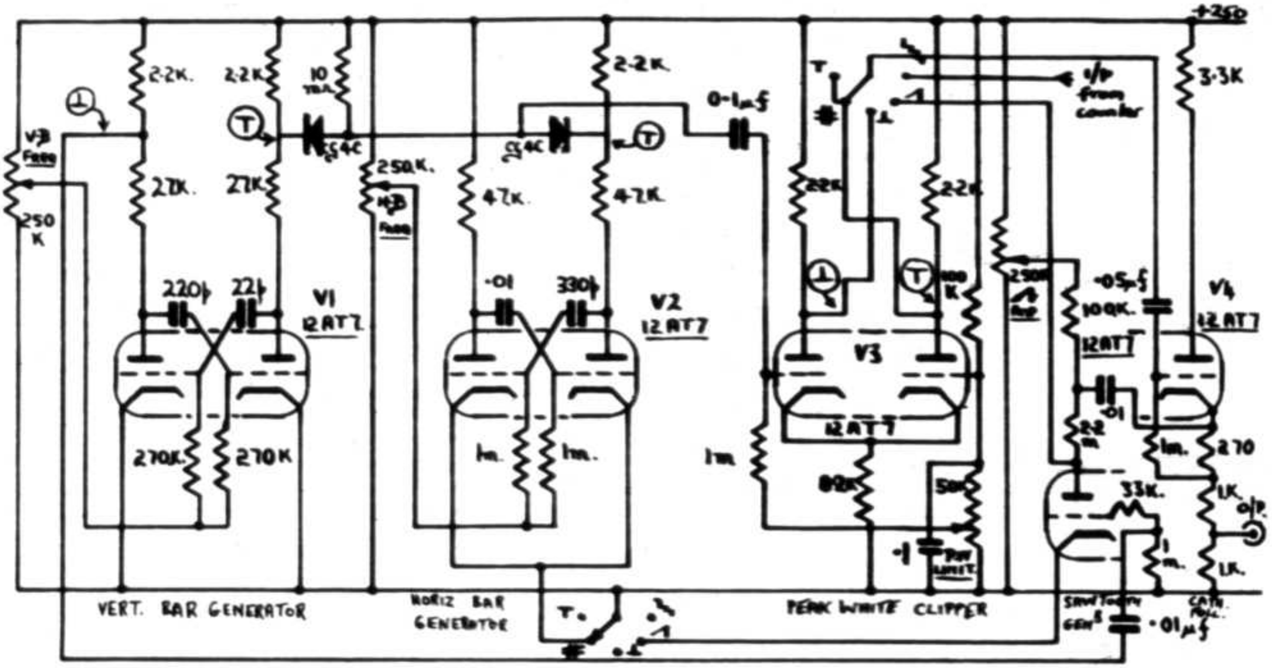
DTY 400.

COMING SHORTLY

"An Introduction to Amateur Television" by M.Barlow; 24pp with 16 circuits and diagrams. To be published soon after Christmas at 3/6d including postage.

A TEST WAVEFORM GENERATOR

By M.Barlow G5CVO/T.



One of the most useful pieces of equipment in the amateur tv station is the test waveform generator. The various patterns, produced electronically, can be used for test purposes, or transmission, without the use of the camera proper. Consider the most popular test waveforms used:

i. Line sawtooth. Used for checking the linearity of the various circuits; most valuable when setting up a transmitter.
ii. Horizontal bar. For checking low-frequency smear.
iii Vertical bar or spike. For checking high-frequency response, ringing, etc. Often combined with ii as a Cruciform.
iv. Grating. For checking picture geometry.
v. Staircase. For producing contrast bars.

These are the most usual test waveforms, roughly in order of importance. Additional ones can easily be produced, but the above selection gives a considerable amount of information as to circuit behaviour.

Since the test waveforms are to be used for testing circuits, it follows that they should be very accurately shaped themselves, and in professional practice considerable complexity is included to attain this. For amateur use, however, much the same results can be obtained by looking carefully at the waveform before and after it has been through the circuit. Thus, an increase in rise or fall time of a vertical bar pulse shows a poor HF response. Tilt or sag on a horizontal bar pulse indicates poor LF response, distortion of the sawtooth indicates clipping, etc.

The unit shown in the diagram uses four 12AT7s to generate Vertical Bars (VB), Vertical and Horizontal bars (V&HB), spike, sawtooth and any external waveform, such as Staircase from the main counter chain. A standard 1 volt non-composite signal is produced at the output of the cathode follower.

V1 is a simple multivibrator with a constant mark/space ratio of about 10:1, and ajustable in frequency from about 1 pulse per line to 6 per line. The 10:1 ratio is necessary to prevent trouble when blanking is mixed later, if 1 pulse per line is being used. Under these conditions, the multivibrator being synchronised to line blanking pulses, the pulse will occur during the blanking period, and a "Peak White" picture can be produced. By altering the speed control, 5 or 6 vertical black bars can be produced. V2 generates the horizontal bars in the same manner, so that anything from a cruciform to a 6 x 6 grating pattern can be produced. Note the method of returning both grid leaks of the multivibrators to the speed controls, thus keeping the mark/space ratios nearly constant. V3 is a phase-splitter peak white limiting stage. Varying the peak-white level control determines the potential at which the other half of the valve comes into conduction. By taking the output from one anode or the other, either black or white bars can be produced; thus the spike output is in fact identical to the VB output, although the PW level control must be reset for this. Taking the output from the other anode of the multivibrator is not satisfactory due to distortion of the m/v waveform with this circuit when the mark/space ratio is high. V4A is a simple integrator; the capacitor from anode to ground charges through the anode resistors until a positive pulse on the grid discharges it. By returning the output of the output cathode follower to a point on the anode circuit, linearisation by "bootstrap" action occurs. There is no difficulty in obtaining a sawtooth that looks really linear at all frequency settings (of the VB control), but adjustment of the sawtooth amplitude control is needed to maintain 1 volt undistorted over the whole range. If difficulty is experienced concentrate on getting the sawtooth linear at line frequency, since this is where it is most needed.

If an external signal is fed in at the grid of V3, its white level can be controlled. Alternatively it can be fed simply into the cathode follower. At G3CVO/T, this test waveform generator is mounted directly below the main sync generator, and so various non-standard links, such as staircase signal and separate blanking signals for synchronising the m/vs, are easily incorporated. The output is normally patched up onto one of the 4 inputs to the vision mixer, and thence back into the main sync generator for blanking and sync insertion.

"FLYING SPOT SCANNING"

On April 14th 1955, Mr M.E.Pemberton gave an illustrated talk to the Chelmsford group on the subject of "Flying Spot Scanning". The lecture was recorded, and an edited version of the tape is available from Grant Dixon (LT4). A brief resume will be of interest to members who cannot hear this tape.

Mr. Pemberton started with the history of FSS, from the early German facsimile units of 1906, to von Arden who built the first film scanner in 1930. The Baird FSS gave very good results using the true flying spot principle, and was installed at A.P in 1936 (240 lines, 50 frames). A Mechau projector - giving a stationary image at all film speeds - and an early EMI Emitron camera was also tried before the war, but results were inferior to the Baird, and also to studio productions.

With the wartime development of CRTs and phosphors, EMI and Cintels both built CRT FSS in 1949. When the Marconi-EMI merger was dissolved in 1949, Marconis began work on film scanners, at first with a projector-plus-image-orthicon arrangement, and latterly with a CRT scanner. (Vidicon film scanners were not included in the lecture). The main aim has been to build a unit capable of operation on any of the major TV standards, with easily replaceable parts, and, in the case of the CRT scanners, capable of being used "backwards" for telerecording.

The major difference between camera and non-camera methods of film scanning is that most camera tubes work on the storage principle, whereas photocells do not. With cine film and a camera, it is very easy to flash light through the film onto the camera during the frame blanking period, and then to scan off the picture normally, pulling the film down at the same time. Since the PEC method is instantaneous, the film must be kept still during scanning, and moved during frame blanking. Since this period varies from 1.33 millisecs for 525 line systems to 3 mS for 819, being generally less than 2mS, there is quite a strain on the projector mechanism, which normally has a pull-down time in the order of 2.5 to 3.5 mS. Several types of fast pull-down projectors have been built, the most succesful of which pull down in about 1.6 mS. Any excess pull-down time of course loses lines on the picture at top or bottom.

The projector demonstrated was a converted Bell and Howell; a 931A photocell was placed in the lamphouse (using the existing condensers), and a 1" Dallmeyer super-six at f 3.5 replaced the old projection lens. The lens was 1 1/9" from the film and 10" from the crt, a 5ZP16. A mirror passed the light beam into the slide scanner for stills. This used a 3" f4.5 Dallmeyer enlarging lens - the simpler lenses being preferred to reduce scatter. 5/- condenser lenses are quite good enough. 2" diam 2" focus ones were used. The scanner video band is 3dbs down at 10Mc/s, but for 405 line amateur work 1.5Mc/s is probably ample (double for 625).

Various types of professional CRT were mentioned the 5ZP16 being preferred for flat face and short persistence. At 25kV the scanning requirements for this tube are the same as for a 14" domestic tv set. Standard scanning circuits are used, although the deflection and focus coils are wound for extreme linearity. Scan-failure relays are fitted, not of the integrating variety, but differentiating the scan to a fine pulse and operating the relays from that. The EHT supply is a ringing choke circuit at 1/3 line frequency, and uses a Cockroft Walton multiplier and a stabiliser.

The PEC feeds a two-valve head amplifier, and its EHT chain is across +250 and -450V. A 100K pot in series with the negative supply varies the gain. The cell load resistor is 1K, giving 1/2 volt of signal at peak white (N.B this figure and the circuits following apply when a 5ZP16 scanner is used only) into a 12AT7 amplifier/cathode follower and thence into the main amplifiers. CR networks in the amplifiers having different time constants correct for the phosphor decay time. For the 1.5Mcs resolution mentioned, a 1K cathode resistor with a small trimmer across it was recommended. Gamma correction is applied before phase reversing if negative transparencies are being scanned.

Appendix: Calculation of optics.
Distance l lens to CRT: $l = mf + f$ where m is magnification raster/film frame.
Distance c film to CRT: $c = f(m+2) + f/m$. f is focal length of lens.

(Continued from CQ-TV 25 p4)

required (approximately twice the PW to SB grid excursion), the degrees of sync and peak white stretching required, the modulator output voltages at various levels, and so on. The practical use of these values is dealt with later.

9.5 Choice of aerial coupling components:

The generalised arrangement for a push-pull output stage is shown in Figure 9/4. L_p and C_p form the tank circuit, L_s and C_s the aerial circuit (which may be either series or parallel tuned), and R_s is the resistance of the aerial feeder (assumed matched). R_s is reflected into the tank circuit as R_p; R_p is equal to R_l, the valve load, for a single ended stage, but in the case of a push-pull stage,

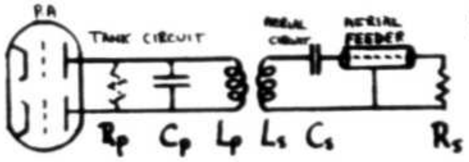
Eq 7. $R_p = 4R_l$.

It has already been stated that for maximal flatness

Eq 3 $Q_p = 2Q_s = 1.414\ Q_o$ where $Q_o = f_o/B$.

The coefficient of coupling k should equal $1/Q_o$.

Figure 9/4



In most cases, R_s, B and f_c are given; using $Q_s = 2\pi f_o L_s/R_s = 1/2\pi f_o C_s$, (or the appropriate formulae for a parallel circuit), all the components in the aerial circuit are determined. Estimating C_p, the total capacity in the tank circuit including strays and the tuning capacity, and using $Q_p = R_p/2\pi f_o L_p = 2\pi f_o C_p R_p$, all the components for the tank circuit are also determined, together with R_l for the valves, since $R_p = 4R_l$. If this value of R_l is not satisfactory (see section 9.4) then a new set of values must be calculated; assuming C_p is already as small as possible to keep B large, then R_s is the only variable. Changing it mismatches the aerial, but this is easily corrected by using a quarter-wave matching transformer to obtain the correct impedance again.

It is not easy to measure the coupling, and the usual procedure here is to adjust the coupling on power, by setting the modulator output voltage to some known point on the linearity curve, say Black Level, and then increasing the coupling until the output stage draws the correct current as read from the original load-line.

9.6 Choice of drive arrangement:

The design of the driver stage and its coupling to the PA grids depends upon, amongst other things, whether or not the PA draws grid current at any modulation level. If not, then the driver stage is simply delivering volts to the PA grids, and can be narrow-band, high efficiency. If grid current is drawn, then the driver stage must supply power to the PA grids, and it may be called upon to do so at a video frequency rate; the driver stage must therefore be a wide-band stage. The load on the driver stage is both reactive and resistive, the first depending on the actual frequency, and the second on the modulating frequency amplitude. To obtain good linearity, the drive (and bias) voltages must remain absolutely constant whether or not grid current is flowing, and so the driver must be either a very low impedance source of RF, or a source of constant impedance at all frequencies. At least four common methods of obtaining these results are in use:

i. The use of a damping resistor or lamp to dissipate the larger part of the drive power, thus effectively swamping any variations due to a changing load. This is very effective, but does mean that a large excess of drive power must be available. (A Class B output stage needs less drive than a Class C stage, so this may not be so important).

ii. The use of a cathode follower driver stage.

iii. The use of a tetrode driver stage plus a "quarter-wave section" (which may actually be a double tuned circuit). This is a constant impedance device.

iv. The use of a hard-driven Class C driver, driven into saturation and using grid leak bias. This gives a high anode impedance and constant RF output, but it requires a lot of drive itself.

These schemes allow for the resistive load, (it should be noted that there is always a fixed resistive load in addition due to the strays associated with the valveholder, etc of the PA), whilst the reactive load is allowed for by damping the various circuits, or by critically coupling them. A further improvement can be made by tapping the PA grids down the driver anode circuit, so that any varying load is only reflected across part of the driver circuit.

The general approach is to start with the bandwidth required, and hence Q_o, Q_d and Q_g (for coupled circuits). R_d is then calculated, and so R_l is known for the driver stage. The RF output swing into this load is found from the loadline, and, knowing the RF drive required by the PA, the step down of any coupling transformer, capacity potentiometer or other tapping-down device can be found. From Q_g any damping resistor can be calculated. Similar calculations hold for all four methods outlined above, but the reader is referred to the literature for detail.

Having given a brief outline of the calculations required, the design of two complete TV output stages will now be followed through.

9.7 Design of an amateur TV Transmitter (Band 1).

Consider using an 829B at a frequency of 67.5 Mc/s; a bandwidth of ± 3 Mc/s to the 3db points is desirable. What is the maximum power output obtainable?

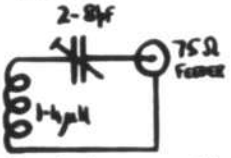
Now: $f_c = 67.5$, $B = 6$. So $Q_o = 67.5/6 = \underline{11.25}$...i.

For the output circuit:

$Q_s = 0.707\ Q_o = \underline{7.95}$. For a series tuned circuit $Q_s = 1/2\pi f_o C_s R_s$; for a 75 ohm aerial feeder,

$C_s = 1/2\pi\times 67.5\times 10^6\times 75\times 7.95 = \underline{3.95pF}$
$L_s = 1/4\pi^2 f_c^{\,2} C_s = \underline{1.4\mu H}$

The aerial circuit might be made as shown on the right.



For the tank circuit:
Assume C_p = 10pF including the tuning capacity.
Therefore $L_p = 1/4\pi^2 f_c^{\,2} C_p = 0.54\ \mu H$
$Q_p = 2Q_s = \underline{15.9} = R_p\times 2\pi f_c C_p$. Hence R_p = 3740 ohms, and so R_1 = 935 ohms.
Drawing in the dissipation curve for 40W per section, we find that the maximum HT permissible with a load of 935 ohms is about 400V for V_{g2} = 200V. $I_a$pk = 360mA, V_a min = 45V; RF swing = 355V, so the RF power developed at peak white at the valve anodes will be about 64 watts. The mean anode current is 230 mA, so that the DC input is 92 watts and the valve efficiency 70%.

The figures show that the valve will deliver some 50 watts of RF to the aerial quite satisfactorily at this frequency, but it is interesting to note that at 45 Mc/s, for the same bandwidth, the HT voltage would have to be reduced to 300 approx. with correspondingly less RF output, to prevent overdissipation of the valve. This is mainly due to the constancy of C_p which cannot be further reduced to counter the reduction in Q_o. To maintain B at its previous value, therefore, R_1 has to be reduced, with the result mentioned.

At this stage one would draw the loadline for R_1 = 935 ohms, and hence obtain a linearity curve as previously explained. Full use will be made of this data in the next section.

9.8 Design of 70cm output stage with QQV06/40.

At VHF the above calculations are not easily applied directly, since resonant line circuits are usually employed, and the circuit Q is often indeterminate. However, ordinary line theory still holds, so that, for instance, there is no difficulty in matching the impedance Z_s to the impedance Z_p by means of a quarter-wave line of impedance Z_m where

$$Z_m^{\,2} = Z_s \times Z_p.$$

Application of this implies that the aerial is tapped directly onto the plate lines of the PA, and this is not good VHF practice. However, since f_c is so high, bandwidth is very little problem, and it will be found in most cases that following normal VHF practice will produce a PA capable of being used in TV service. Thus C_p is normally kept as low as possible in order to make the plate lines as long as possible, and this suits our purpose perfectly. The physical construction of the PA tank and aerial circuits will be dealt with later; for the moment consider just the QQV06/40 (or its American equivalent the AX9903).

Reference to table 9.1 gives three sets of figures; in all cases the power output is similar, and the bandwidth more than ample. Outside considerations now become important; the HT supply to the screen, for instance, must be stabilised. It helps therefore if the screen current loading does not change too violently. An ST280/40 or 280/80 will take up 40 or 80mA change of screen current respectively, and they have a convenient tap at 210V (280V is above the limit for this valve). Readers unable to obtain Stabilovolts (large neons) will have to run the screens from a stabilised supply - perhaps the main 250V video HT. Much the same considerations apply to grid current - the less the grid current, the less the output impedances of driver stage, bias supply and modulator will affect transmitter linearity. The main HT to the anodes need not be stabilised (as long as the screen supply is stabilised) but it may be advisable to use a choke input filter to keep the HT volts from varying too greatly. In this case remember that the HT voltage will be only about 70% of the transformer RMS output voltage.

Taking some typical figures, assume a 425V-0-425V HT transformer with a choke input filter (see Chapter 10) delivering some 350V of smoothed HT; let the screens be fed from a 210V line stabilised with an STV280/80 neon. Following section 9.4 draw the loadline for maximum power output on the curves for V_{g2} = 200V (the nearest value given by the makers). It will be found that this line becomes a tangent to the dissipation curve just before the condition for maximum output is reached, so this is the limiting condition. This line represents R_1 = 820 ohms. For interest we shall compare results under these conditions with those for R_1 = 1200 ohms, a line that might be used if insufficient drive is available. The two linearity curves are shown in Figure 9/5, together with the curves for the same values of R_1, but with the screen voltage at 250 volts.

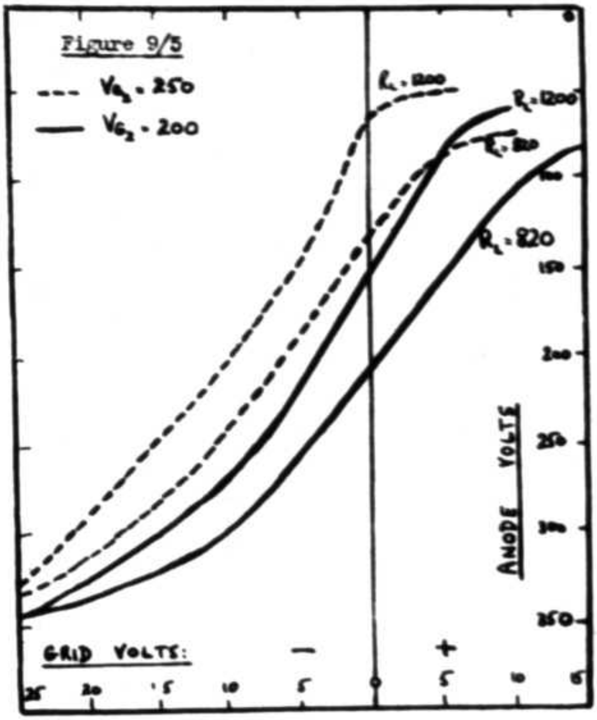


Figure 9/5

G 2 DUS/T

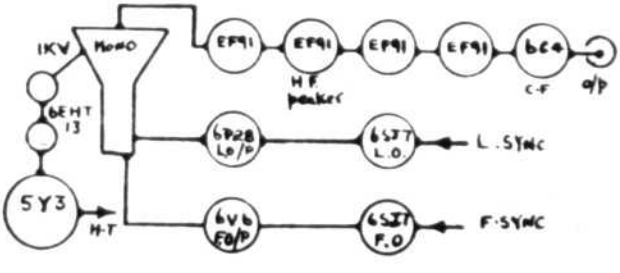
A founder member of the BATC, Ivan Howard G2DUS/T has always been well to the fore when it comes to results. His 5527 camera display at various radio club meetings, including the 1950 RSGB Exhibition, put ATV on the map, and gave plenty of encouragement to the rest of the members. For a long time he had the only ATV camera in the country that was actually working, and the results obtained with this obviously home-made equipment were extremely good. Although very busy at his job, and despite domestic upheavals such as moving house and getting married, Ivan has continued his experiments in all directions, and currently runs a Staticon camera, a 5527 camera/telecine unit, a monoscope unit, bar generator, 70cm transmitter and receiver, besides his other activities such as tape recording and electronic organs, cine filming and working mobile on the LF bands. Ivan is a very willing talker, and will go to tremendous lengths to give some out-of-the-way ATV group a first class demonstration of his latest equipment. He has been much more reticent with regard to giving enough detail to write an article for CQ-TV, however, and this is in fact the first description of his gear you will find in CQ-TV.

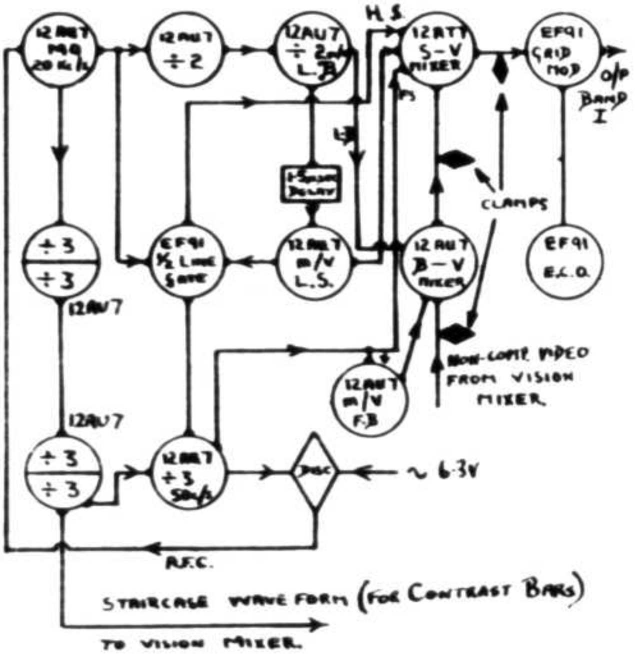
G2DUS/T SELF-CONTAINED TV TRANSMITTER

Ivan arrives to give his demonstrations in a small van, from which he unloads a couple of 17" tv sets, a mass of cables, and a small rack, 19" wide and about 3' high. This carries three TU6B boxes which contain the whole of the video and RF distribution gear. The master pulser is shown in block form below; the counter chain uses APN4 blocking oscillator transformers with 12AU7s and EB91 isolating diodes counting in small steps 3-3-3-5. The pulse shaping circuits are fairly straightforward; double-diode clamps are used rather than simple DC restorers in the mixing stages, as Ivan finds this gives a steadier Black level. This unit also generates patterns, one advantage of using low counts in the counter chain being that 3 and 5 bar patterns are useful, these appearing as "contrast bars" on the picture. Another 12AU7 multivibrator generates vertical bars when required. Also in this unit is the RF distr-

The monoscope unit occupies the second TU6 box, the monoscope tube being inside and the power supply bolted onto the rear. EHT for the tube (1kV) is generated by a Cockroft-Walton multiplier from the low-level HT transformer. The second video stage acts as a high peaker, and the 2.5 Mc/s bars are easily seen on the final picture. The choice of scanning tubes was governed by what was in the junk box at the time!

-ibution circuit (in a screened box); an ECO-PA grid modulated by the video at about 3 volt level is used. A phase reverser allows positive or negative pictures to be transmitted - always good for a "Guess who?" feature.





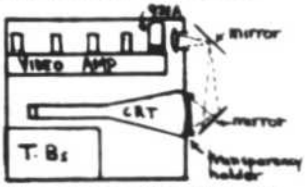
The third box carries the Staticon camera control unit, focus current stabiliser, and so on. The camera tube itself is mounted in a Power Unit Type 297 cast aluminium box, about 8"x4" sq. the head amplifier is a 6BQ7A cascode - ECC85 - 6AK5, with feedback from this stage to the input to improve gamma. An EF91 video stage precedes a 12AT7 frequency correcting stage, and another EF91 drives an EF91 triode-connected cathode follower. This amplifier fits very compactly into one side of the box, the tube and its coils occupying the other. An MW6-2 running at 7kV (Cockroft Walton from the 800V camera supply) is being fitted as a viewfinder. A lens turret is fitted, normal lenses being a 35mm f3, 25mm f1.9 and 75mm f4.5. With a poor tube, a typical aperture is f16 in sunlight, but with a good tube, f1.9 gives very good results without lag in normal room lighting. 30' of camera cable, containing 2 co-ax, 4 75 ohm twin, and 12 pvc leads, provides power, blanking and scanning to the camera, and talkback to the operator.

This is the broad outline of the gear; we hope to be printing detailed circuits shortly.

"WHAT THE OTHER BLOKE IS DOING"

By Theodore S. Bungstattner.

Here's a word for the telecine types, until now highly neglected (your own fault, why not write in??). R.H.Shepperd on the Whaling Factory vessel "Balaena" writes that the old FSS telecine unit has been scrapped. He has now built a Staticon camera, and followed Mr. McGee's advice to point the camera straight at the cine projector. "The result was very fine! The projector and camera are both available for use separately, and the bulk is much less than for the old FSS unit. The 16mm projector is used quite unmodified, with normal pull-down, and no synchronism between film speed and scanning speed is necessary. With film at 24 fps either 25 or 30 frame speed can be used, with only a very slight flicker noticeable. When using the projector care must be taken not to burn the end of the tube; to reduce flicker the 110V 500W lamp is run at 70V via an autotransformer. With both camera and projector fitted with lenses, it is tricky to get a focussed picture to fill the whole tv screen, and a single lens system is preferred. (P.Burrage suggests using a pin-hole as there is plenty of light available). With the target bias backed off and the amplifier gain cut down, a picture very free from spots and noise is obtained!" G2DUS/T is another telecine type; two units are available, one using the 5527 and a shutter that exposes the film during frame blanking periods, and the other a staticon unit on similar lines to R.H.S's above.



G3DFL has rebuilt the flying spot scanner into a smaller space by using a periscope type mirror system as shown on the right. The pulse unit is now in a small rack (405 line interlaced), but the PSU and monitor crt are due for an overhaul. Positive transparencies are used, these being blown up from 2¼ sq negatives. Also at Birmingham, George Planner writes that his health is improving, and that the TV transmitter is having a major overhaul. The QQV03/10 went west, but a new one is to hand, and George will be on the air with 9.5mm cine films again later in the year; the basic scan is at 25 cs, scanning from bottom right to top left looking at the raster. After each scan, the raster is displaced downwards, so re-scanning the same film frame. Locking is accomplished rather neatly; a neon is flashed from frame pulses, and the light is picked up on a photocell after passing through the sprocket holes (on 9.5mm film these are in the middle of the film, one per film frame). The PEC output is amplified and rectified and fed to an electromagnet used as a clutch on the motor drive spindle. The DC output is zero when the film is in sync. The system is not perfect yet, but George admits that with an ACR1X scanner the overall definition is not good enough anyway to notice the slight jitter! Incidentally he recommends the BC 929A (about £2) as a good buy for a waveform monitor including a 3BP1 and a ready-made 10 kc/s time base.

H.Cox (Brampton, Suffolk) is at University College, London, where he keeps his 5FP7 slide scanner demonstrated at the Convention. This gives very fair results as viewed on a VCR97 monitor, but a new monitor is required before experiments proceed much further. H.C has his finals this year, though, and so will have to let ATV slide. Grant Dixon at Ross has built a three-channel colour vision mixer to handle his camera, bar generator and projected slide scanner. The bar generator gives black, white, magenta, cyan, yellow red, blue and green bars with an optional grading from full saturation to white in the vertical direction. It uses three multivibs triggered from line pulses, suitably delayed and mixed, plus a step waveform. The pictures from the colour camera are now much better since more attention has been paid to gamma and linearity.
Ernie Marko W2MPQ/4 is at Patrick Air Base, Florida, together with two Image Orths, two vidicons and a few other bits and pieces. Hmm. He reports that the surplus airborne TV camera units with the 1849 ike are now retailing at $99 complete with tubes and lens. The whole unit runs off 24V, and Ernie says the release of these has helped considerably since the price of the 5527 was trebled. If anyone wants one, write to Ernie at 1155F School Ave, Patrick Air Base, Florida, USA and he'll see if he can ship one over. From New Zealand Harry Burton ZL2AFC is building a 405 line sync generator, having wrecked the old 245 line one plus its VCR112 FSS. He says that John Grounsell has built a 17" tv set for reception of his tv signals "eventually"! Jack Mason has an RCA 1849 Ike on the way out from George Wynn, who has changed to a Staticon. George is on duty in Europe, and is hoping to visit European ATV men. He is currently at Metz. Eric Cornelius at Wagin, West Australia, now has the Staticon running "like a two-bob watch". Running 625 lines, resolution at the picture centre is better than 3.5 Mc/s, and a bit under 3 Mc/s at the edges. At the moment the alignment coils are not fully satisfactory, and Eric got insufficient line scan due to thinking that 6AU5s were the same as 6V6s. Orthodox circuitry and a 6V6 solved it; all the deflection circuits are mounted in the camera head. The amplifier is a 12AT7 cascode, then 4 6AC7s with 6Mc/s bandwidth, cathode peaking in the first two. Circuit lifted largely from a circuit for an image orth in "Television Broadcasting" by Chinn. Viewfinder is a 5FP7 fitted with a blue filter. Deflection orthodox, except that line output tubes are scarce out there, and Eric uses a FZ-064A Japanese tube, similar to an 807! He finds the 5HP7 is similar in all respects to the 5FP7. Warren Jacobs now has a 5527, but at last count was producing fine pictures of the mosaic ring and mounting structures. Eric is another who complains of HT requirements; the camera runs 90 mA at 280V, and needs 6 or 8 6F6s to stabilise it. He says 6AS7s are £8 there, and wants suggestions (so do we). For Australian use (neg mod, 625 line) Eric is now standardising on 4V neg pulses across 75 ohms, with video white positive 1.4V across 75 ohms. He runs f14 out of doors and f1.9 inside at a pinch. Complains that he needs 24 tubes in the

NEW MEMBERS

G.Abrams Victoria Rd, Rushden, Northants.
J.B.Blair Market Place, Southwell, Notts.
F.Brown G3JQP 72 St Mary's Rd, Ilford, Essex.
D.Butler G3DKM 43 Grand Ave, Hassocks, Sussex.
M.Castell 451 Cowley Rd, Oxford.
J.E.Chalwin 4 Bishop Rd, Chelmsford, Essex.
E.H.Chaudri G3DCS 202 Broomfield Rd, Chelmsford.
C.D.Crosby 14 Millbridge Rd, Witham, Essex.
M.H.Cox Brampton Rectory, Beccles, Suffolk.
E.P.Essery G3KFE/T 174 Guildford St, Lozells,
Birmingham 19.
K.W.Ettinger Lodz, ul. Piotrkowska 80/3, Poland.
D.W.Faulkner 58 The Ridgeway West, St Albans.
E.C.Foster ZL2AUB c/o P.S.Hostel, Boat Harbour,
Wellington N.Z.
W.D.Foster P.O.Box 8022, Wellington N.Z.
K.B.Freeman 17 De Freville Ave, Cambridge.
D.S.Froome 39 Manor Way, Egham, Surrey.
R.Greenfield 117 Earls Hall Ave, Southend-on-Sea.
J.H.Grounsell 1 Norfolk St, Belmont, Lower Hutt, N.Z.
D.J.Melton P.O Box 351, Gwelo, S. Rhodesia.
J.V.Mercer 42 St Mary's Rd, Ilford Essex.
S.A.Morley G3FWR 22 Old Farleigh Rd, Selsdon, Sy.
R.Nolan ZL2QR c/o CAA Shelly Bay, Wellington NZ.
T.Pegram 16 Woodland Rd, Chelmsford, Essex.
H.F.L.Rogers 64 Chadville Gdns, Chadwell Heath, Essex
G.B.Rogers 584321 Sgt, Sgts Mess, RAF Yatesbury, Wilts.
M.J.Sparrow Orchard Hill, Showell Lane, Penn, Nr
Wolverhampton.
B.Sykes G2HCG "Rosslyn" Debdale Rd, Northampton.
W.Wallace 71 Colling Ave, Deneside, Seaham, Co.Durham

Changes of Address: 431

A.C.Bevington G5KS 76 Causeway Green Rd, Langley, Staffs; F.C.Cox 9 Mount Rd, Parkstone, Dorset; A.R.Eyles 28 Alderbury Rd, Newport, I.o.W; E.Marko W2FMQ/4 1155F School Ave, Patrick Air Base, Florida, USA; H.S.Hughes GW4CG "Clyne", Austin Ave, Newton Porthcawl, Glam; V.C.Leek, 58 Baldwyns Park, Bexley, Kent; E.H.Page "Hill View" Drimpton, Nr. Beaminster, Dorset; N.F.J.Schembri G3CEM 5 Garston Cres, Calcot Nr Reading, Berks.

STATICON COILS: Ivan Howard G2DUS/T has had great trouble getting a reasonable line scan with coils and transformers wound to the BATC data sheets. He is now using a Pye B16T output transformer and coils of 160 turns each of 30 swg enamelled wire. With a 5K potentiometer and a 0.005 mfd mica capacitor, correct damping is easily obtained. The line o/p tube is a 6V6 running at 30mA.

CORRECTION: CQ-TV No. 22 P5, circuit of Vision Mixer unit; the Transmission "Cut" buttons are paralleled and joined to 220 ohms and 560 ohms in series. These two resistors should be reversed, so that the 220 ohms is to earth. As drawn, there will be a violent change in level from "Cut" to "Mix". Similarly, preview buttons 1-2-3-4 should have two resistors of 5.6K and 2.2K to earth, the junction going to PB5 and also button 6. Otherwise there will be a 6db difference in signal on preview transmission to any of the other preview inputs. Sorry!

PAoZX is again running his TV sked at 1600 Sat 3750kc.

Wearite type 666 Bias Blocking filter coil with 5000p tunes 20 kc/s nicely; 6/- -G2DUS/T.

Pye B16T line o/p Xfmrs (for Staticons) 36/6 ex Pye's.

For reading the Club microfilms any small viewer giving a picture some 3"x 2" is sufficient; or a magnifying glass will do at a pinch. 284 pages of CQ-TV for 17/6.

G.March 28 Walton Rd, Southend has a complete 405 line video test rack for sale: syncs, FSS, monitors, PSUs, CRO, etc a complete station in fact. Offers.

G3EKE has a new stock of Club badges at 3/6 each, or 5/- with a 5 letter call-sign.

camera or more leads in the camera cable, already 1¼" thick with three 3-core flexes and 3 co-axes. (Running the HT and LT down the inners?).

Mike Cole (Chelmsford) wants information on absorption modulation at 70cms. M.Barlow is now licensed as G3CVO/T, but is suffering from freq. modulation of the vision tx by the PA blower motor! The waveform monitor and test waveform generator are now in operation, with the pulse generator and RF distribution units partly completed. A new 32 element array is under test, birds permitting... Arthur Critchley suggests mixing a 1.1666 Mc/s AM signal with the main 145 Mc/s drive to the transmitter, and using the 142 Mc/s output to drive a low-power PA for the sound channel.

Carlos Reyes in Costa Rica is building a 67 Mcs TV tx with 625 line negative mod. He asks if anyone has a good video sweeper design. George Wynn (Metz) was using cathode-coupled blocking oscs in the counters, but found that this saturated the BO transformers. Rewiring as a conventional BO but taking the o/p from the cathode loads gave much the same outputs as before.

G2WJ/T and G3KKD/T gave a magnificent display at the National Radio Show. One side of the RSGB stand was converted into a spacious studio for the two cameras. A monoscope was also in use, and for the 10 days of the show, ATV was really in the public eye. Good work, oms. G3KKD/T and P.Bligh are to try and send pictures from Cambridge to Dunmow shortly.

Dick Forge G3FRG writes from Worthing that he is not contemplating taking out a /T ticket, but that Peter Robinson is the Worthing ATV station, callsign G3KPH/T, since March last. Apparently P.R is still curing troubles in the video and pulse circuits, so has not yet applied for a camera tube. Closed cct FSS experiments were on the go some time ago, but not too satisfactorily. There is no news of the RF side of things.

CHELMSFORD have planned their season's meetings: lectures have been given by G2DUS (Staticon camera) and will be given on "Test Waveform Generators", "Television Camera Tubes", "A Flying Spot Scanner", "UHF Aerials" and "How Not To Wire Up Vision Gear". Meetings are held on the second Thursday in each month.

ROMFORD group have had several meetings and are planning extensive modifications to existing gear. The big camera is running satisfactorily apart from minor scanning troubles, and the 5527 unit is being rebuilt by Ron Oakley and Frank Brown. It is hoped to make a slide scanner as well, and the group hopes to liaise with Chelmsford via 2m. The group offers to demonstrate their gear to any other clubs interested in the London area. Meetings every Thurs.

AMSTERDAM meeting on October 25th - PAoZX and others.

No news from Canada, Glasgow, Nottingham, Southampton.

CLUB STANDARDS

To enable members to run their equipment with units of other members' equipment, certain standards have been recommended by the Committee. You are not, of course, in any way obliged to comply with the standards, but many members are doing so, and all units available on general loan conform to these standards.

Electrical Standards

All outputs 1 volt peak-to-peak across 75 ohms. Composite signals to have white positive, sync negative. Syncs on their own to be negative going. Normally only frame sync, line sync, (or mixed sync), video and composite signals will be supplied or used. Synchronising signals, and general vision standards, to be suitable for feeding into a domestic television receiver adjusted for the reception of BBC programmes. Either 405 line double interlaced or 200 line 50 pictures per second sequential scans may be used.

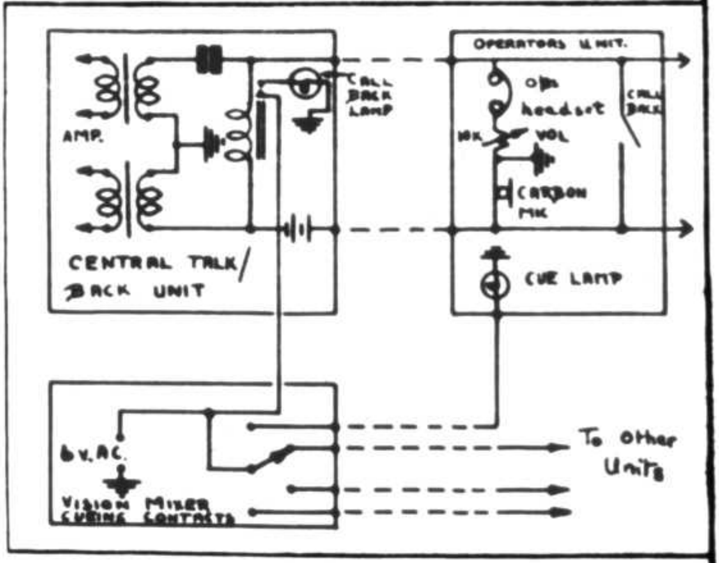
Studio sound equipment will normally be supplied as a complete unit. Where sound and video are to be distributed at RF, inputs to the sound mixer and/or modulator should be 1 volt across not more than 600 ohms.

Intercommunication facilities: a Central Battery system will be used, each operator requiring a headset and carbon microphone only. Either direct or amplified signals will be used; when amplified, any combination of programme sound, camera-to-control and control-to-camera talkbacks will be available. Normal twin-headsets will be used, these to be provided by the operator with the microphone. A three-wire distribution system will be used, one wire also carrying cue-lamp signals. 6 volt (at least) cue lamps should be used with one side grounded. The microphone and headset should be in series and wired to a terminal block (see below). For call-back a shorting key may be placed across the speech lines.

Mechanical Standards

Either standard GPO 19" racks, or 15" racks to be used (the latter will go in a car).
19" panels to be multiples of 1¾" high, drilled 0 BA (¼") clearance, 7/8" in from ends, 7/8" from top and bottom, 1¾" centres.
15" panels to be multiples of 2" high, drilled 2 BA (No. 10) clearance, ½" in from ends, 1" from top and bottom, 2" centres. Vertical members of rack to be not more than 1⅛" wide at front, 1" preferred, drilled and tapped 0 BA every 1¾" (19") or 2 BA every 2" (15").

Belling-Lee plugs and sockets are preferred, standard sizes for ¼" co-ax. H.T to be at 250V regulated and -150V stabilised; 6.3V AC and 230V AC will be supplied. Inputs to be at the left hand side of the unit viewed from the rear, or wiring, side, with outputs and HT feeds at the right (as in conventional circuit drawing).



THE BRITISH AMATEUR TELEVISION CLUB

MEMBERSHIP APPLICATION FORM

Please fill in this form in BLOCK LETTERS, and send with remittance to the Hon. Secretary, BATC, at 56, Burlington Gardens, Chadwell Heath, Essex.

I, ...(Name)

...............(Callsign, etc) of ....

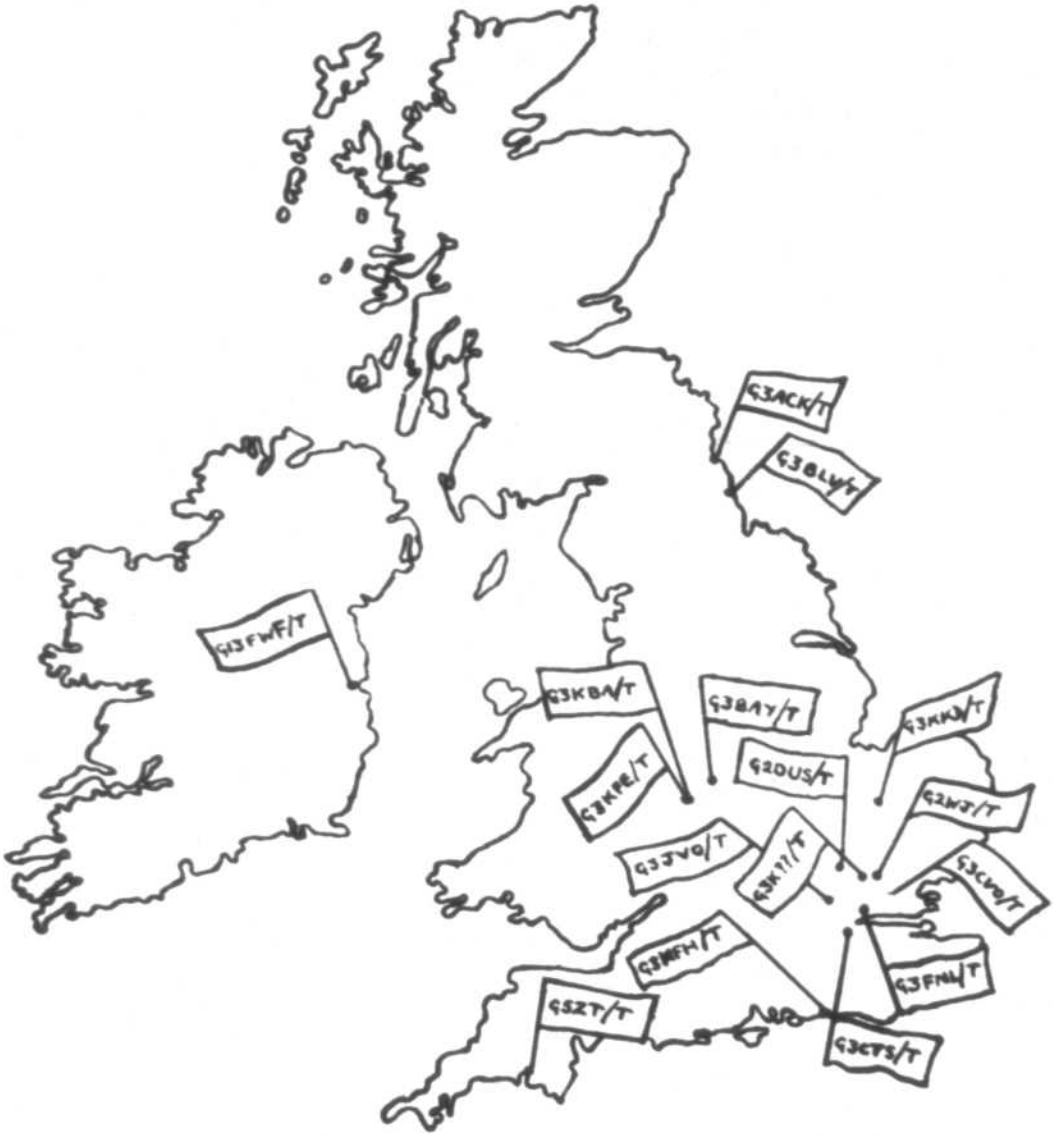
....

.........................(address) wish to joi the British Amateur Television Club, and I enclose a cheque/PO, payable to the Club, to cover my enrolment. Please send me the next/current edition/ any back copies you have of "CQ-TV", and backdate my subscription to cover these.

Signed...........................Date.........

Office use G3AKJ/[illegible]/G3CVO Cash Mag
Date replied Ref No.

Overseas members may remit cash by International Money Order, UNESCO coupons, or in local currency as preferred. Typical overseas subscriptions: USA and Canada $1.00; France 250f; Germany DM3; Italy 450 lira; Netherlands f2.50



COVER PICTURE: The camera control unit and main monitor of Ian Waters, G3KKD/T, of 14, St Mary's St, Ely.